New e- driven e+ source for MM

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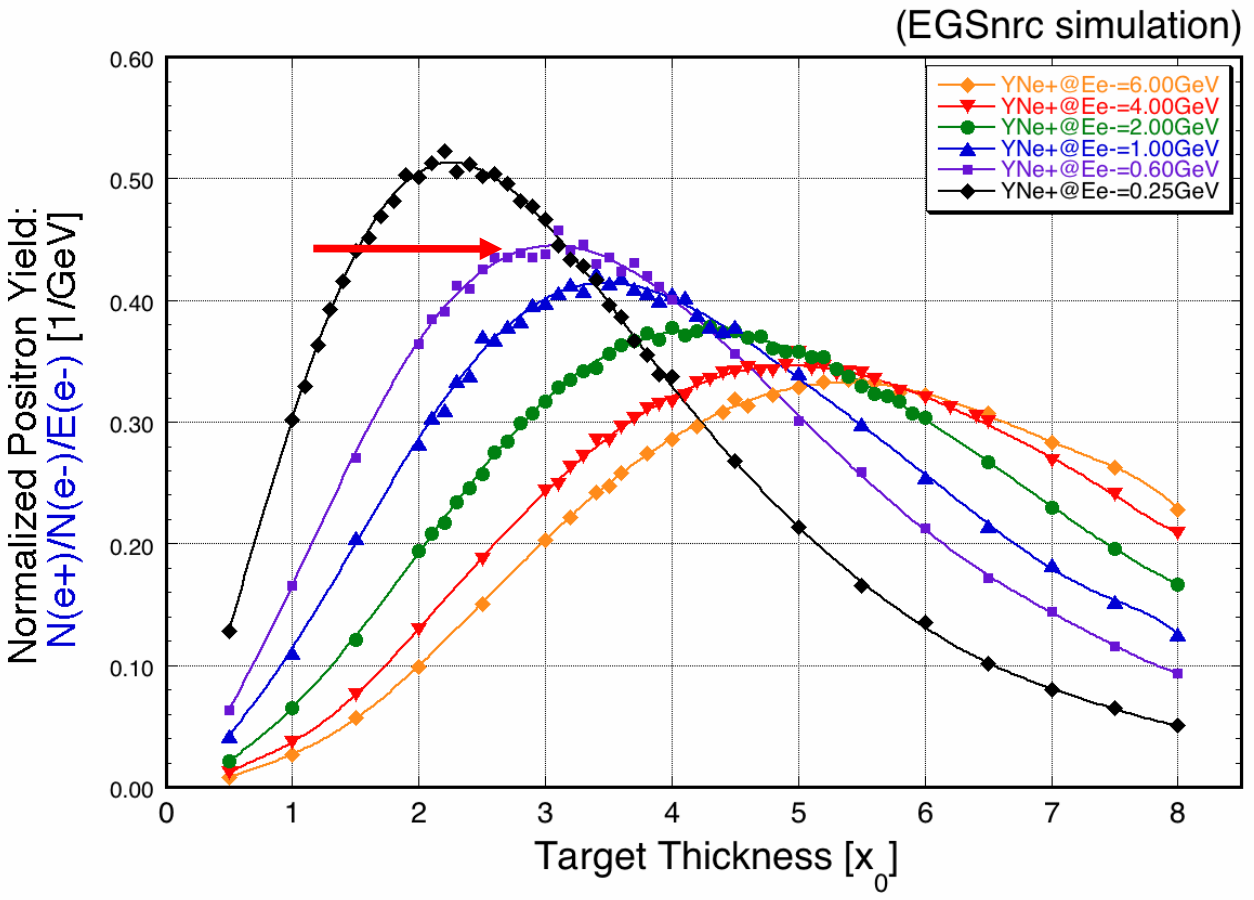
New e- driven e+ source for MM

- MM is an approach (case study) to reconfigure the current baseline driven by cost with potential higher risks and less operational margin.
- e- driven conventional e+ source is the only one method, which ever been operated, but some risk on the conversion target.
- If this cost is cheaper than undulator, it is very suitable for MM study.
- The risk is concentrated on the conversion and capture devices, which can be controlled by appropriate R&D.

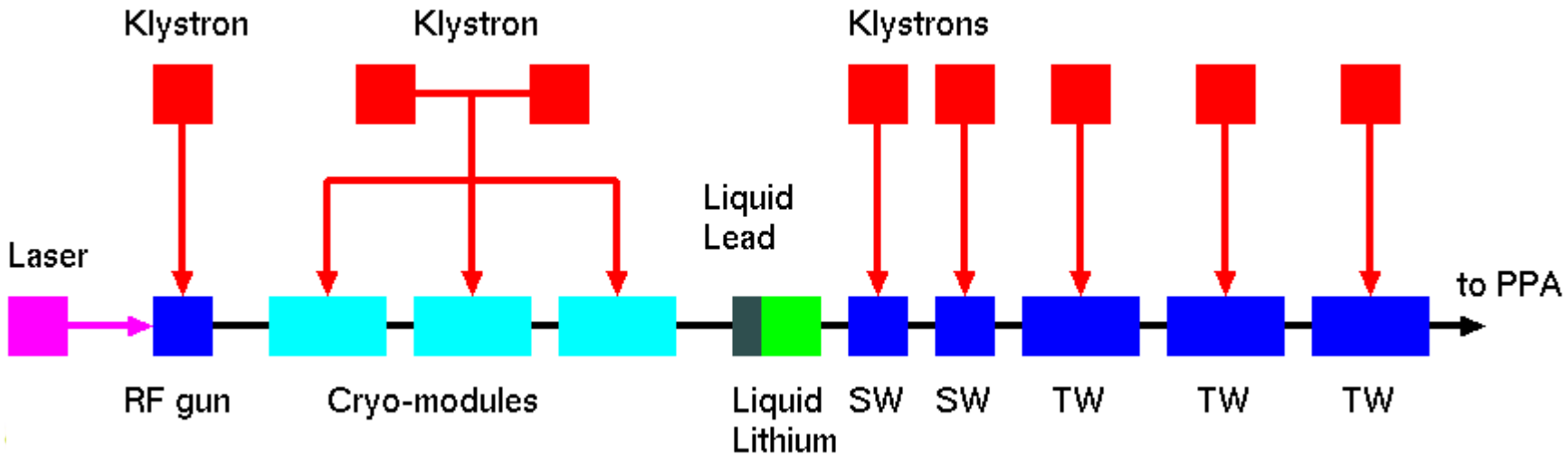
Positron Yield for MM case

- Drive beam : 700MeV, 160 % intensity electron (5.12nC).
- $3X_0$ target makes ~51% intensity with AMD.
- Liquid Lithium lens makes the capture efficiency double; It is 102%.



ILC e+ soure for MM

- L-band RF gun (FLASH type) generates ILC format beam with 5.1nC bunch intensity.
- One RF section (2 klystron for high beam power drives 3 cryomodules, 24 cavities) accelerate it up to 700MeV.
- Liquid lead target + Liquid Lithium lens for high capture efficiency.



Cost study

- Cost difference is accounted.
- What we can remove
  - **3GeV linac (accelerator and tunnel) 18.8 +6.6 =25.4M**
  - **Undulator + TBM tunnel (600m) : 8.3+13.2=21.5M**
  - **DC gun and SHB : 3.9M**
  - **KAS (400MeV NC S-band) :4.8M**
- What we should add
  - **L-band RF gun (SW RF): 0.99M**
  - **700 MeV SC linac (2 klystron + 3 cryomodules) + 50m tunnel : 4.7 + 1.1= 5.8M**
  - **Target is different, but the cost is assumed to be identical. 0M**

Cost Summary

Subsystem	Subtracted	Added
Gun	3.9	0.99
SC linac	25.4	5.8
Undulator	21.5	0
Mimimal KAS	4.8	0
Target	7	7
Subtotal	62.6	13.79

Cost reduction : 62.6-12.7 = 48.8 MILC

New ILC e+ source for MM

- The new ILC e+ source is feasible for MM.
  - **It has a significant cost reduction.**
  - **It has a potential risk, but it can be controlled.**
- Undulator is not suitable for MM because it leads a definite change on our scope.
  - **The cost minimum solution (U is at the end of linac, constant undulator length) results luminosity loss in any case for lower energy operation.**
  - **To fulfill the required luminosity, the undulator length becomes incredibly long.**
- We kept the undulator as our baseline and the new ILC e+ source for MM study.

ILC e+ source TDP1

- Undulator is our baseline.
- The new e- driven is a working assumption for MM study.

Potential Sub Effects

- The emittance of the generated positron beam is larger. DR acceptance should be confirmed.
- The degree of freedom of the layout and operation is much increased. Further optimization for better availability, operability, cost saving, etc. are possible;
  - **No need for adjustment on the round trip path to be an integer of DR circumference.**
  - **No operational dependence to other subsystems.**
  - **The system do not have to be stuck in BDS. Construction and commissioning scenario becomes much simpler.**

Summary

- New ILC e+ source for MM is proposed.
- The cost is cheaper.
- This configuration is principally feasible for MM study.
- Operability is recovered by this independent configuration.
- The possible risk is on the conversion target, but it can be controlled by R&D.
- Undulator is the baseline; The new e- driven is a working assumption for MM.
- Potential sub effects should be studied.